If present trends continue, the world in 2000 will be more crowded, more polluted, less stable ecologically, and more vulnerable to disruption than the world we live in now.
Council on Environmental Quality
Global 2000 Report, 1980

The Price of Cigarettes

The direct costs of smoking cigarettes are well known: more than 400,000 people die each year in the United States from tobacco-related diseases such as lung cancer and heart disease, according to the Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia. Less well recognized are the indirect effects smoking has on the environment, particularly the production of waste from consumption (including paper and plastic packaging and cigarette butts) and the deforestation associated with tobacco farming.

No butts about it. The environmental costs of tobacco products are more than just smoke.

"The waste products of cigarettes are clearly visible whenever you walk down the street or use a public beach," says Thomas E. Novotny, a public health physician at the CDC. After analyzing the available data on cigarette consumption, Novotny and colleague Feng Zhao concluded that cigarette debris requires attention from environmental groups, industry, and government. The results of their study were published in the August 1999 issue of *Tobacco Control*.

Worldwide, an estimated 5.5 trillion commercially produced cigarettes were consumed in 1995 (the last year for which statistics are available) and 83% of cigarettes were filter-tipped. Filters and plastic wrap from packages remain in the environment for long periods. Cigarette filters contain cellulose acetate, which persists under normal environmental conditions for 18 months or longer. Moreover, cigarette butts pose a health hazard to children and animals if they eat them.

In Australia, cigarette butts ranked sixth among all items of trash collected from roads, parks, and public facilities on one recently monitored cleanup day. Volunteers with the Washington, DC-based Center for Marine Conservation participate in the International Cleanup Project along shorelines in 90 countries each year. According to the center, in the 1998 cleanup, cigarette butts were the leading item collected, accounting for almost 24% of all items found. Cigarette butts were nearly four times as likely to be found as the next most frequently found items (pieces of plastic).

In addition to the waste generated by cigarette consumers, the tobacco manufacturing process itself produces liquid and solid wastes. Novotny and Zhao's research showed that in 1995 worldwide tobacco manufacturing produced 2.26 billion kilograms of solid waste and 209 million kilograms of chemical waste. Ironically, the trend toward "healthier" low-nicotine cigarettes spawns nicotine as a waste product. The U.S. Environmental Protection Agency (EPA) includes nicotine on its Toxics Release Inventory, a list of hazardous chemicals that require special disposal. "The tobacco industry is moving manufacturing processes to developing countries, and this has environmental consequences," says Novotny, who explains that developing nations generally lack environmental watchdogs such as the EPA.

To remedy tobacco waste problems, Novotny and Zhao propose enforcing laws against cigarette butt littering, levying taxes on cigarettes to offset cleanup, forcing the tobacco industry to improve the biodegradability of filters and packaging, and increasing public awareness of the magnitude of the waste problem. "We should insist that tobacco companies and consumers become more environmentally responsible," says Novotny.

Just as litter is an offshoot of tobacco consumption, so deforestation is the result of tobacco production, argues geographer Helmut Geist of the University of Louvain in Belgium. According to research by Geist published in the same issue of *Tobacco Control*, between 1991 and 1995 an estimated 200,000 hectares of forests worldwide were removed to make way for tobacco farming each year, mostly in developing countries in Africa, Asia, and Latin America. In 1961, world tobacco production was 3.8 million tons, half of which was grown in developing countries. In 1998, world tobacco production reached 7.8 million tons, with 80% being grown in developing countries.

Woodlands are often considered free goods in developing countries, and are cut without concern for replacement. Trees are burned to cure (dry and flavor) tobacco leaves in barns (which are also built from local wood). Globally, tobacco curing requires 11.4 million tons of solid wood annually, according to Geist's study. Adding insult to injury, tobacco plants may replace the trees cut down and leach large quantities of vital nutrients from the soil. Although the environmental consequences of deforestation due to tobacco farming are not well studied, Geist suspects that soil erosion, nutrient depletion, changes in microclimates, and land degradation do occur. "Tobacco deserves to be integrated into research programs on global environmental change," he says.

Herbal Authority

As consumers worldwide continue to buy medicinal herbs in an effort to find what they hope to be safer and more natural remedies, health care providers are finding themselves unable to answer their patients' questions or to predict the health effects of various herbal preparations. A collaborative project of the World Health Organization (WHO) Traditional Medicine Programme and three scientists from the University of Illinois at Chicago (UIC) College of Pharmacy may provide the answers physicians and patients alike are seeking. In June 1999 the WHO–UIC group published a comprehensive review titled *WHO Monographs on Selected Medicinal Plants, Volume 1*, which covers the safety, efficacy, and quality requirements of some of the world's most commonly used medicinal plants.

The volume comprises 28 technical monographs covering 39 distinct species of medicinal plants, which were chosen because of their wide use. According to coauthor Gail Mahady, a research assistant professor in the Department of Medicinal Chemistry and Pharmacognosy (the study of the bioactive substances in organisms), the volume is intended for healthcare professionals, drug regulators, and people interested in technical information on medicinal plants. The monographs will act as guidance in the preparation of quality control standards, future monographs, and formularies for the use of the plants described.

According to a survey of trends in alternative medicine use that was published in the 11 November 1998 issue of the *Journal of the American Medical Association*, U.S. consumers were spending as much as $5.1 billion annually on herbal products as of 1997. In addition, about 18% of all prescription drug users reported using herbal remedies or high-dose vitamins along with their prescribed medications, despite the fact that much is currently unknown about the drug interactions and contraindications of the herbal products so readily available to the public.

To compile the monographs, the WHO–UIC team, which also included Harry H. S. Fong, a professor of pharmacognosy in the Program for Collaborative Research in the Pharmaceutical Sciences in the College of Pharmacy, and Norman R. Farnsworth, director of the same program, systematically reviewed literature published around the world since 1975, relying heavily on another highly credible source of information on medicinal herbs, the Natural Products Alert, or NAPRALERT, database. This database, administered by the Program for Collaborative Research in the Pharmaceutical Sciences, contains over 100,000 citations from the world scientific literature on the safety and efficacy of herbal medicines, plants, marine organisms, and fungi. The writing team also reviewed various pharmacopoeias including the *European Pharmacopoeia*, the *Deutsches Arzneibuch*, and the *Farmakope Indonesia*, as well as monographs produced by other bodies such as Commission E, which researches and regulates medicinal herb use under the German government.

The first part of each monograph includes pharmacopoeial summaries of quality assurance—a description of each plant's botanical features, correct Latin binomial, geographical distribution, methods to identify the plant, purity requirements, chemical assays, and a listing of the major chemical constituents. This information may help with one of the biggest problems with commercially sold herbal remedies, which is that there is little or no standardization of the therapeutic dose of many medicinal plants. As matters stand, herbal products may not contain enough of the purported key ingredient to produce any beneficial effect or the product may not contain the correct part of the plant. In other cases, experts say, remedies may contain herbal ingredients whose dangers outweigh any beneficial properties.

The second part of each monograph describes medicinal uses, pharmacology, contraindications, warnings, precautions, adverse reactions, and dosage. This part is aimed at health care practitioners who may be faced with patients taking herbal products or who may wish to prescribe medicinal herbs themselves, and is written so that the busy clinician can quickly become familiar with each herb's medicinal properties without having to winnow through the entire pharmacology of the plant.

The WHO–UIC team's work was reviewed by a panel of over 120 authorities from 40 different countries. The panel included academics, experts in the field of herbal medicine, industry specialists, and regulatory authorities, including representatives from the U.S. Pharmacopeia, which establishes standards to ensure the quality of medicines intended for human and veterinary use. The team has already completed a second volume of 32 additional monographs that is scheduled for publication in early 2000. The researchers and the WHO are discussing the possibility of a third volume.

EPA Sees the Light on Fluorescent Bulbs

Finalization by the U.S. Environmental Protection Agency (EPA) of a rule that places mercury-containing fluorescent bulbs under the Universal Waste Rule, regulated by the Resource Conservation and Recovery Act (RCRA), will encourage recycling and proper disposal of the bulbs by making it easier and cheaper to recycle them. The rule will thus reduce the amount of hazardous waste reaching

WHO Monographs on Selected Medicinal Plants, Volume I*

Allium sativum **(garlic)**
Aloe vera
Astragalus membranaceus **(huang qi)**
Brucea javanica **(Chinese gall)**
Bupleurum falcatum **(thorow-wax)**
Bupleurum falcatum **var.** *scorzonerifolium*
Cassia senna **(senna)**
Centella asiatica **(gotu kola)**
Chamomilla recutita **(chamomile)**
Cinnamomum verum **(cinnamon)**
Coptis chinensis **(huang lian)**
Coptis deltoides
Coptis japonica
Curcuma longa **(turmeric)**
Echinacea angustifolia **var.** *angustifolia* **(coneflower)**
Echinacea angustifolia **var.** *strigosa* **(coneflower)**
Echinacea pallida **(pale purple coneflower)**
Echinacea purpurea **(purple coneflower)**
Ephedra sinica **(ma huang)**
Ginkgo biloba
Glycyrrhiza uralensis **(gan cao)**
Paeonia lactiflora **(Chinese peony)**
Plantago afra **(psyllium)**
Plantago asiatica **(che qian zi)**
Plantago indica **(black psyllium)**
Plantago ovata **(blond psyllium)**
Platycodon grandiflorus **(balloon flower)**
Rauvolfia serpentina
Rheum officinale **(Indian rhubarb)**
Rheum palmatum **(Chinese rhubarb)**
Thymus vulgaris **(common thyme)**
Thymus zygis **(Spanish thyme)**
Valeriana officinalis **(valerian)**
Zingiber officinale **(ginger)**

*Monograph covers varieties and select plant parts of the plants listed above.